

This drawing is based on a design prepared by the Midwest Plan Service (MWPS) at Iowa State University. For more specific details concerning the design refer to Midwest Plan Service Publication TR-9, Circular Concrete Manure Tanks (March 1998). This drawing may be used for tanks which are above or below ground. The design is in accordance with ultimate strength design requirements detailed in ACI 318-95.

Design Loading:

- 1. Manure load: 65 psf/ft. of depth.
- 2. Soil backfill loads: 65 psf/ft. of depth with no surcharge or 60 psf/ft. of depth with 120 psf lateral surcharge. This requires the structure backfill to be adequately drained. To meet this requirement see backfill details on this sheet.

Construction Notes:

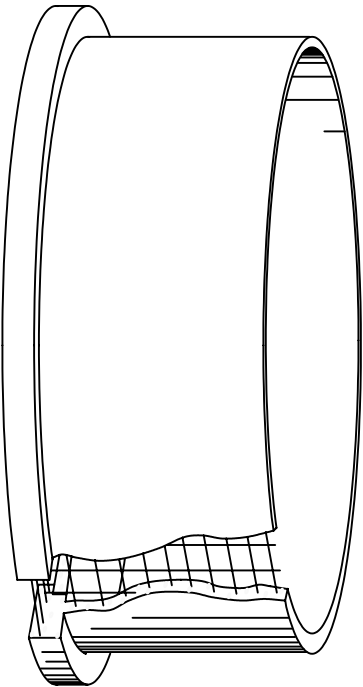
- 1. Reinforcing steel for footing and walls shall have a tension yield point of fy = 60,000 psi. Refer to Sheet 2 for floor reinforcing steel grades.
- 2. For splice lengths refer to the table on Sheet 2. All bends in reinforcing steel shall have a minimum inside radius of 3 bar diameters.
- 3. All concrete shall have a minimum 28 day compressive strength of 4,000 psi. The mix design shall be submitted to NRCS prior to placement. Unless shown otherwise in the construction specifications, the following requirements shall apply:
 - Cement shall be Type I or Type II
 - Slump – 4 inches plus or minus 1 inch.
 - Air content from 5 to 7 percent.
 - Aggregate size – maximum of 1 inch diameter.
 - Construction joints – cleaned prior to subsequent concrete placement.
 - Cure concrete for a minimum of 7 days – acceptable methods are:
 - membrane forming curing compound at rate of 1 gal/150 s.f.
 - leaving the forms in place
 - soaking / continuous spray
- 4. Construction joints may be used to ease construction. The location of construction joints shall be approved by the Engineer prior to placing the concrete.
- 5. Refer to manufacturers recommendation for placing waterstop material.
- 6. Backfill shall be brought up uniformly around the tank. The maximum difference in the finished backfill elevations around the tank shall be 4 feet.
- 7. All construction methods shall meet OSHA regulations.
- 8. Installation of this structure shall conform to NRCS Construction Specification 313.

Safety Considerations:

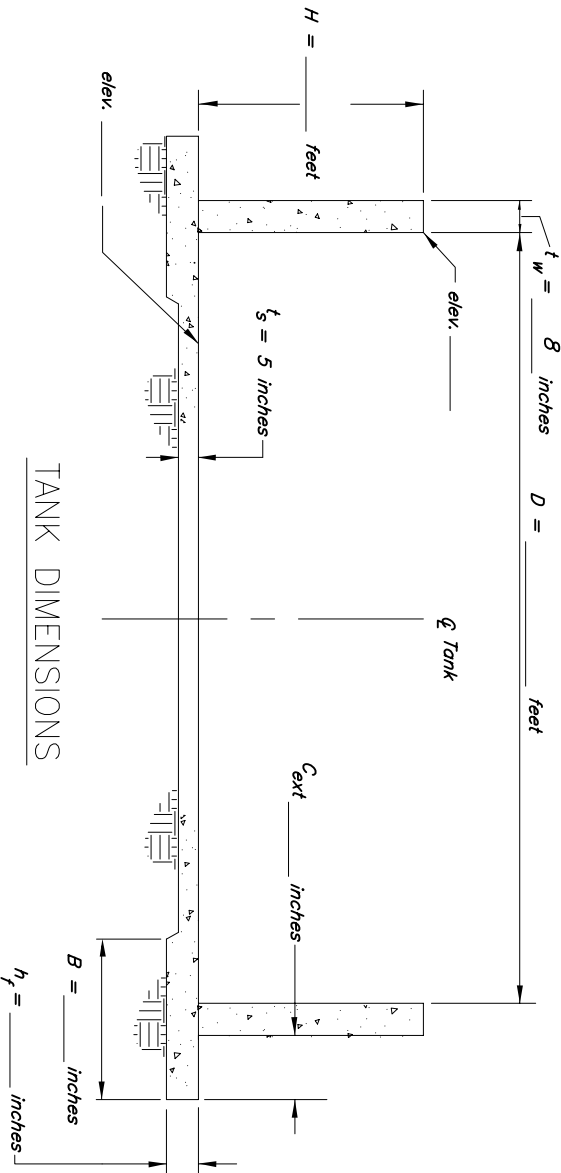
- 1. The tank shall be surrounded by a chain link or woven wire fence.
- 2. Posts shall not be cast into the concrete wall, unless an 8" rebar is welded to the base of the post and the posts are capped at time of installation.
- 3. Safety stops shall be installed at pushoff locations to prevent accidental entry of equipment.
- 4. Warning signs shall be erected around the tank stating that entry may result in injury or death.

Vehicle Access

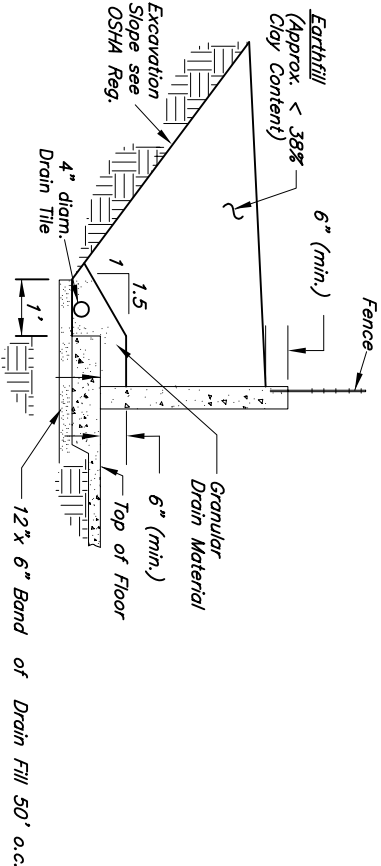
If heavy tank wagons, or trucks will be driven within a distance equal to the wall height from the edge of the tank, cast a 8 inch thick concrete slab along the traffic route by the tank. The concrete slab should be large enough to eliminate any wheel loads directly on the natural ground or backfill by the tank. The purpose of the slab is to distribute the loading along the tank wall and prevent mud and erosion.



CIRCULAR CONCRETE MANURE TANK



TANK DIMENSIONS

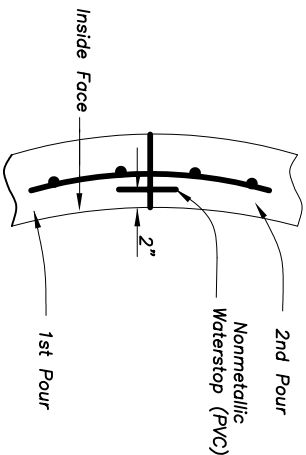
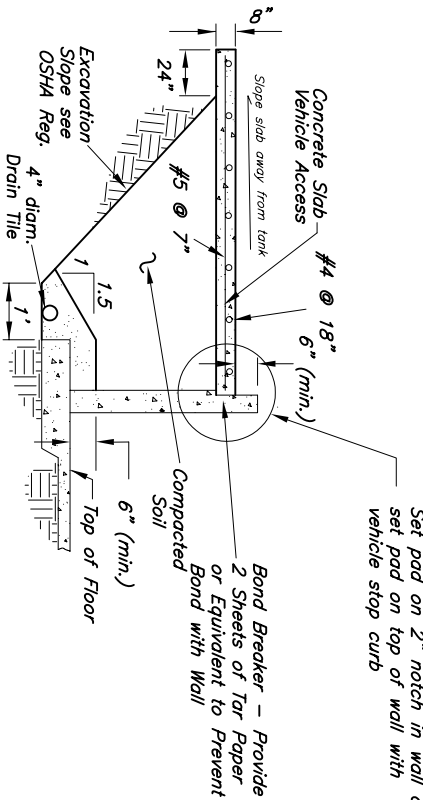


WALL BACKFILL DETAIL-TYPICAL

- 1. Provide a minimum 4 inch diameter perimeter drain tile for wall backfill drainage. Outlet the tile at a location downslope where flow from the outlet may be monitored. Provide heavy wall pipe where backfill cover is < 24". Provide an animal guard on all outlets.
- 2. If a high water table is present a special drain design will be required under the tank floor to prevent uplift.
- 3. To provide adequate drainage, the granular drain material shall be clean with maximum 5 percent fines. The maximum particle size shall be 1.5 inches.
- 4. Provide a 12"x6" band of granular drain material under the footing every 50' on center around the tank perimeter.
- 5. Provide minimum 3' of backfill over top of footing for frost protection.

WALL BACKFILL DETAIL-VEHICLE ACCESS

** Vehicle access slab is required if heavy tank wagons or trucks are driven within a distance equal to the wall height from the edge of the tank.



PLAN VIEW

TYPICAL WALL JOINT DETAIL

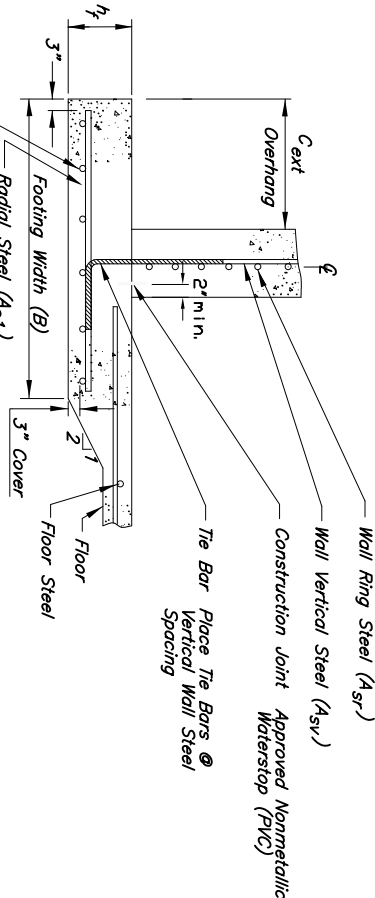
Designed _____	Date _____	Approved _____	Date _____
Drawn _____		Title _____	
CADD _____ WAC	12/99		
Revised _____ HLS	06/07	Title _____	

RING FOUNDATION

Footing Dimensions and Steel						
Wall Height	Tank Diameter	Footing Width	Footing Depth	Overhang	Radial Steel	Ring Steel
H	D	B	h_f	C_{ext}	A_{s1}	A_{s2}
8 ft.	all	30 in.	10 in.	12 in.	Place A_{s1} at vertical wall steel (A_{sv}) spacing. For spacing greater than 9 inches use #5 bars, otherwise use #4 bars (#5 bars could be replaced with #4 bars at $1/2 A_{sv}$ spacing).	#4 @ 8 in.
10 ft.	all	36 in.	12 in.	14 in.		#4 @ 6 in.
12 ft.	all	48 in.	12 in.	14 in.		#4 @ 6 in.
14 ft.	all	60 in.	12 in.	15 in.		#4 @ 6 in.

- For tanks 10 feet and deeper, required soil bearing pressure shall be at least 2,000 psf; tanks less than 10 feet require 1,500 psf.
- Place ring steel 3 inches above the footing bottom.
- Place radial steel on top of ring steel.

Place the 1st horizontal ring steel bar 1/2 the specified spacing above the footing.



MONOLITHIC FOOTING/FLOOR PLACEMENT

WALL TO RING FOUNDATION DETAIL

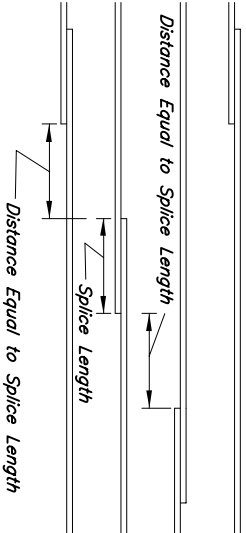
FLOOR STEEL

DISTANCE BETWEEN JOINTS		FOR 5" THICK FLOOR	
	A_s	EXAMPLE	
$\leq 30'$	.029	6x6-W1.4xW1.4 (10 ga.)	
$>30' \leq 60'$	.058	6x6-W2.9xW2.9 (6 ga.)	
$>60' \leq 90'$	.087	#3 @ 15"	
$>90' \leq 140'$	.12	#4 @ 18"	
$>140' \leq 200'$	.19	#4 @ 12"	

This table is for floors on coarse granular or cohesive material. For floors on sand or pervious geotextile, A_s may be reduced 50%.

* See PA-004 and PA-063 for joint details

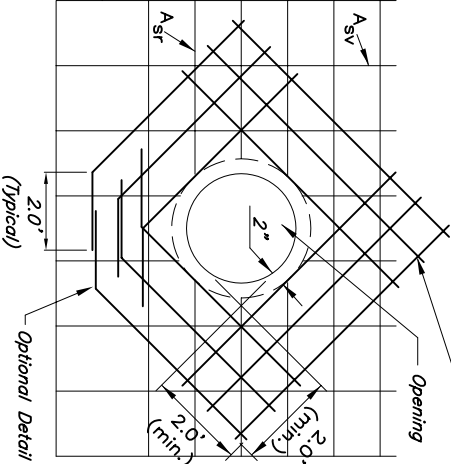
SPLICING DETAIL FOR WALL AND FOOTING RING STEEL



Bar Size	Min. Splice Lengths
#3	16 inches
#4	20 inches
#5	24 inches

SPLICE LENGTHS FOR ALL BARS

Use Only #5 Bars Around Opening



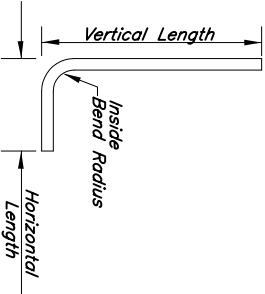
- For tank sizes not listed use the steel spacing & wall thickness from the next larger tank size (Maximum height is 14 feet, maximum diameter 120 feet).
- Ring steel shall be located along the wall centerline.
- Place vertical steel on the outside of the ring steel.
- See Midwest Plan Service, Publication TR-9, Circular Concrete Manure Tanks (March 1998) for alternative ring steel placement (Tables 4, 5, 6, and 7).

DETAIL OF PIPE PROTRUDING THROUGH A WALL

WALL STEEL REINFORCEMENT

Wall Height	8 ft. (8" thickness)		10 ft. (8" thickness)		12 ft. (10" thickness)		14 ft. (10" thickness)	
Tank Diam.	Bar Size	Spacing	Bar Size	Spacing	Bar Size	Spacing	Bar Size	Spacing
30 ft.	#4 @ 12"	#4 @ 12"	#4 @ 12"	#4 @ 12"	#4 @ 12"	#4 @ 9"	#4 @ 11"	#4 @ 7"
45 ft.	#4 @ 12"	#4 @ 12"	#4 @ 10"	#4 @ 12"	#4 @ 9"	#4 @ 11"	#4 @ 7"	#4 @ 11"
60 ft.	#4 @ 12"	#4 @ 12"	#4 @ 8"	#4 @ 11"	#4 @ 6"	#4 @ 10"	#5 @ 8"	#5 @ 12"
75 ft.	#4 @ 12"	#4 @ 12"	#4 @ 8"	#4 @ 10"	#4 @ 6"	#5 @ 7"	#5 @ 8"	#5 @ 10"
90 ft.	#4 @ 8"	#4 @ 12"	#4 @ 7"	#4 @ 9"	#4 @ 6"	#4 @ 8"	#5 @ 7"	#5 @ 9"
105 ft.	#4 @ 8"	#4 @ 12"	#4 @ 7"	#4 @ 8"	#5 @ 8"	#5 @ 9"	#5 @ 6"	#5 @ 8"
120 ft.	#4 @ 6"	#4 @ 12"	#4 @ 6"	#5 @ 8"	#5 @ 9"	#5 @ 6"	#5 @ 7"	#5 @ 7"

TIE BAR CONFIGURATION



1. Use the same bar size as A_{sv}

PENNSYLVANIA ROUND TANK DETAILS

U.S. DEPARTMENT OF AGRICULTURE - NATURAL RESOURCES CONSERVATION SERVICE